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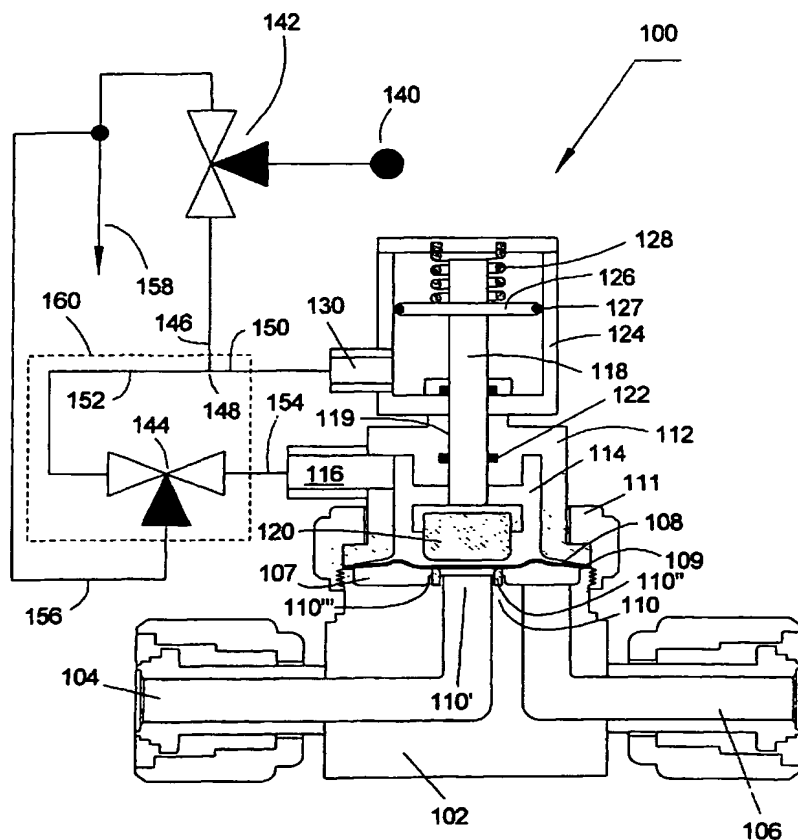
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(54) Title: **FAIL SAFE PNEUMATICALLY ACTUATED VALVE**



(57) Abstract: Apparatus and method for fail-safe high-speed-pneumatic valve is disclosed. Fail-safe dependability is provided by a spring-loaded normally-closed pneumatic actuator. When the spring-loaded actuator is pressurized, the normally closed mechanism is actuated to the valve active position. Concurrently, the pressure is directly applied to deflect a diaphragm or a bellows-assembly back to sealing position. Ultra high purity embodiments with standard dome shaped diaphragms are disclosed. Additional high conductance diaphragms and bellows embodiments are employed for higher conductance valves. Novel flow path layouts are disclosed. The valves are applicable for fast gas and fluid switching and are particularly suitable for high productivity Atomic Layer Deposition (ALD) applications. Additional embodiments cover improved diaphragm and seal reliability, externally adjustable valve conductance, improved valve safety and high temperature valve seals.



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**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,*

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